

ABSTRACT

Disclosed is a new type of magnetoresistive random-access memory (MRAM) device using a magnetic semiconductor, which is capable of achieving high-integration and energy saving in a simplified structure without any MOS transistor, based on a rectification effect derived from a p-i-n type low-resistance tunneling-magnetoresistance-effect (low-resistance TMR) diode with a structure having a p-type half-metallic ferromagnetic semiconductor, an n-type half-metallic ferromagnetic semiconductor and at least one atomic layer of nonmagnetic insulator interposed therebetween, or a rectification effect derived from a p-n type low-resistance tunneling-magnetoresistance-effect (low-resistance TMR) diode with a structure devoid of the interposed atomic layer of nonmagnetic insulator.